Miscellaneous Topics

- Speech To Radio Transmission
- OSI Reference Model
- Erlang Concept

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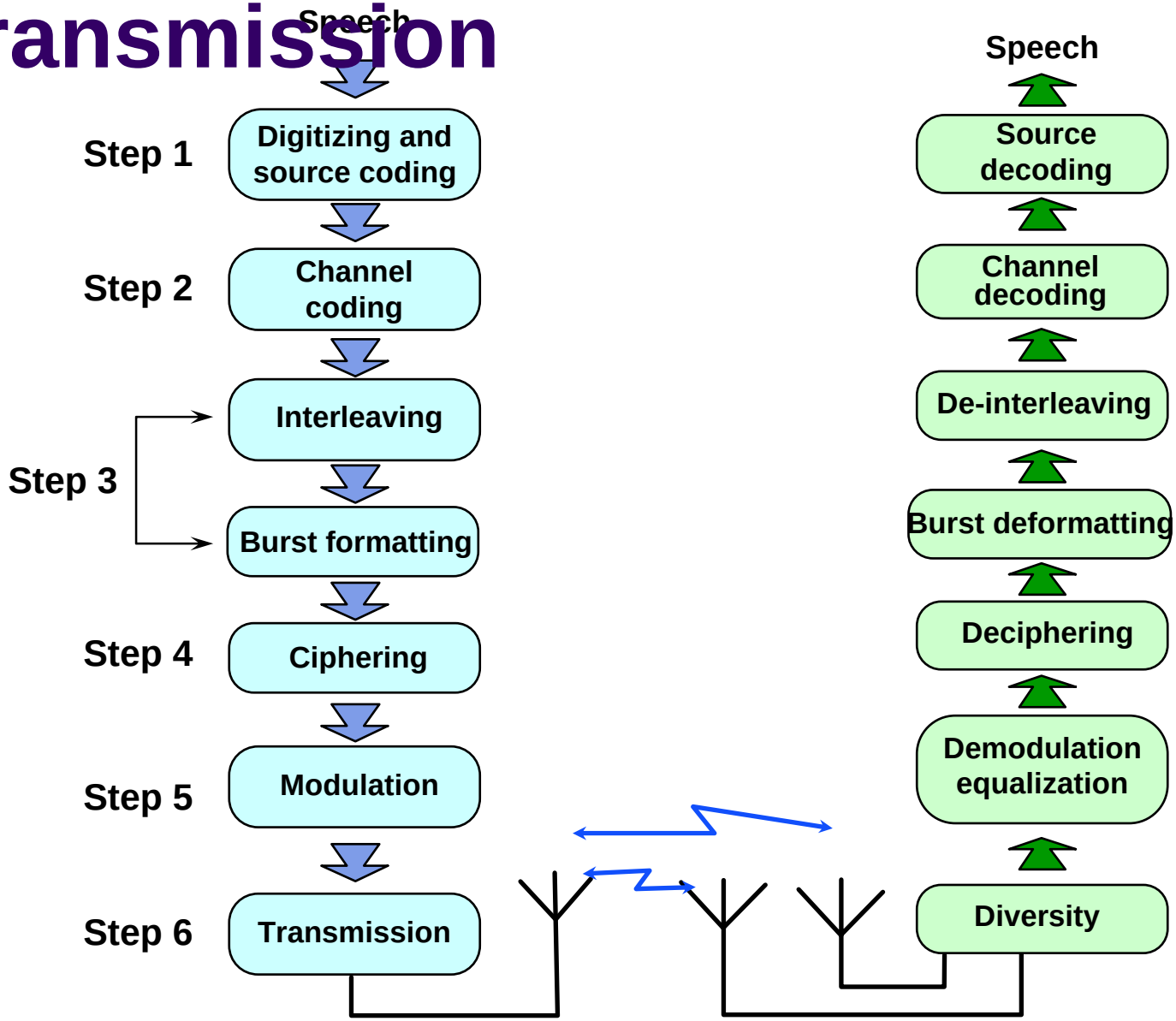
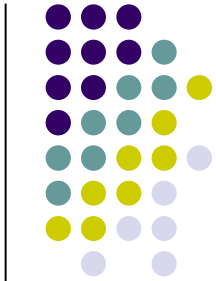
From Speech to Radio Transmission



From Speech to Radio Transmission

- From speech to radio signal, several operations are performed. The reverse transformations are performed on the receiver side.
- Main operations are the following:
  - **Digitizing**: Speech blocks are first digitized to obtain digital blocks: 20 ms speech = 260 bits.
  - **Source coding** uses low bit rate code for air interface.
  - **Channel coding** uses codes enabling detection and correction of signals errors. The result is a flow of code words (456 bits long).

From Speech to Radio Transmission



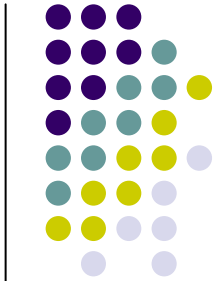
- **Interleaving and burst formatting** spread the bits of several code words to expand data of the same block in different bursts. The results is a succession of blocks, one block for each channel burst.
- **Ciphering** modifies the contents of these block through a "secret recipe" known only by the mobile telephone and the Base Transceiver Station, thus protecting data from eavesdropping.
- **Modulation** transforms the binary signal into an analog signal at the right frequency and moment using Gaussian Minimum Shift Keying (GMSK).
- **Transmission** amplifies and radiates the resulting signal as radio waves via an antenna.
- **Diversity** are different techniques used to provide the reception quality.

From Speech to Radio Transmission

- **Demodulation**: From the radio waves captured by the antenna, the portion of the received signal which is of interest to the receiver is demodulated.
- **Deciphering** reverses the encryption "secret recipe".
- **Burst de-formatting** and de-interleaving puts the bits of the different burst back in order to rebuild the code words.
- **Channel Decoding** reconstructs the source information from the output of the demodulator using added redundancy to detect or correct possible errors.
- **Speech decoding** operates as suitable filters receiving the voice parameters, then performs them out analog speech.

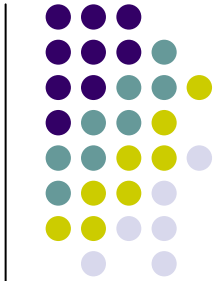
- Chapter No.11 (Speech to Radio Transmission)

OSI Reference Model



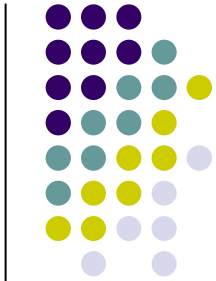
Layer		Description
7	Application	Selects necessary services
6	Presentation	Data conversion function
5	Session	Administration
4	Transport	End-to-end reliability
3	Network	End-to-end routing
2	Data Link	Point-to-point transfer
1	Physical	Cables and interfaces

OSI Reference model



- The OSI model defines seven layers of “peer” protocol where each layer communicates with its corresponding layer using the lower level layers as a transmission medium. For ommunications between the two end points of a call (person to person or modem to modem etc) each successive layer adds its protocol message to the information to be sent. At level 1 this collective data is transmitted over the physical medium. At the receiving end, these protocol messages are interpreted at the appropriate layers and stripped off with the remainder of the information being passed up to the next layer until all of the protocol messages have been removed and the original information arrives at its destination.

OSI Reference model



- Levels 1 to 4 of the model are concerned with the reliable end to end transport of information across the network and layers 5 to 7 are application protocols concerned with the exchange of information between the end users.
- Layer 6 (Presentation Layer)
- This layer governs the rules about how the information is to be presented and exchanged in common language. Examples of the functions of this layer include translations, text compression, file transfer and terminal handling.

Layer 7 (Application Layer)

- This the topmost layer interfaces directly with the user programs which it supports. Examples of functions are the support of distributed databases, computing and operating systems.

Erlang Concept

Average number of busy channels during the period of observation (usually, the peak hour).

Erlang is the unit of statistical resource use.

Example:
One user speaking on the phone for three minutes out of one hour will need:
3/60 = .05 ERLANG or 50 mErl

Erlang B:
At some time some users can need the resource simultaneously:
the use of the resource is associated with a blocking rate.

Erlang C:
When users request the resource at the same time, instead of rejecting the extra calls, users are requested to wait some time before getting the line.

Erlang Concept

- Erlang concept is in chapter No.3
- Example 3.3 & 3.7 are not included from chapter No.3

GSM Extended

- **The GSM 900 system is required to operate in the following frequency band, with a carrier spacing of 200 kHz:**

- **MS transmit, Base receive (880) 890 - 915MHz**

- **Base transmit, MS receive(925) 935 - 960 MHz**

- **refer to E-GSM**

GSM 1800/1900

- **The GSM 1800/1900 systems are required to operate in the following frequency bands with a carrier spacing of 200 kHz:**

- **Frequency band of GSM 1800**

  MS transmit, Base receive 1710-1785 MHz

- **Base transmit, MS receive 1805-1880 MHz**

GSM 1800/1900

- **Frequency band of GSM 1900**
- **MS transmit, Base receive 1850 - 1910 MHz**
- **Base transmit, MS receive 1930 - 1990 MHz**